Controls on Scientific Information Exports†

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This article analyzes recent attempts by the United States government to restrict the release of scientific and technical information—in particular research conducted under the auspices of universities—to foreign nationals. Until quite recently, the government's virtually exclusive instrument for restricting transfers of information was classification. On grounds of national security, certain information was classified as secret, to be revealed only to a comparatively small group of people, those with "clearance" and a "need to know."

Rules specifying the types of information that can be classified, and those with authority to do so, have been embodied in various executive orders. The current Executive Order on National Security Information, issued by President Reagan in 1982, classifies information only if "its unauthorized disclosure, either by itself or in the context of other information, reasonably could be expected to cause damage to national security."1 The categories of information that may be classified under Reagan's executive order include "scientific, technological or economic matters. . ."2 The order, however, also explicitly states that "[b]asic scientific information not clearly related to the national security may not be classified."3

The Reagan executive order, like previous executive orders, pertains to "any information or material, regardless of its physical form or characteristics, that is owned by, produced by or for, or is under the control of the United States Government."4 The criteria for

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2. Id. § 1.3(a)(6).
3. Id. § 1.6(b).
4. Id. § 6.1(b).
classification in the Reagan executive order, however, differ from previous orders in several important ways. Under the Carter executive order, for example, information could be classified only if it “reasonably could be expected to cause identifiable damage to the national security.” The requirement that damage to the national security be identifiable seemingly made classification under the Carter standard considerably more difficult than it is under the current Reagan executive order. In contrast, the Eisenhower executive order permitted classification merely if it “could be prejudicial to the defense interests of the nation.”

It may seem curious that the President can issue without congressional approval an executive order that drastically broadens the range of classifiable information. Legal scholars appear to agree that executive orders on classification lie within presidential power. Presumably, this power is constrained by the First Amendment, but there is no legal precedent which indicates that President Reagan’s imposition of controls on information which “reasonably might be expected to cause damage to national security” violates the First Amendment. The meaning of “national security,” moreover, is far from clear. The Reagan executive order gives a rather uninstructive definition: “National security means the national defense or foreign relations of the United States.”

Executive orders are not the only basis for classifying information under United States law. For instance, under the Invention Secrecy Act, a patent whose disclosure “would be detrimental to the national security” can be classified on a renewable year-to-year basis;

6. See Halperin and Adler, Re: Draft Executive Order on National Security, (Feb. 9, 1982) (memorandum released by the Center for National Security Studies). However, an analysis by the Information Security Oversight Office, which administers the government’s classification program, distributed March 19, 1982, by the U.S. House of Representatives Committee on Science and Technology, states: “The term ‘identifiable’ has been omitted. . .to overcome litigation problems concerning the intent of the language of E.O. 12065. It is not intended nor does experience indicate that its omission will result in information being classified. . .which would not be classifiable under E.O. 12065.”
8. The phrase “appear to agree” is used advisedly. It is difficult to find unequivocal assertions about the legal underpinnings for classification by the Executive. For useful discussions and other references to the relevant scholarly literature, see Cheh, Government Control of Private Ideas — Striking a Balance Between Scientific Freedom and National Security, 23 JURIMETRICS J. 1, 15-17 (1982); Greenstein, Federal Contractors and Grantees: What Are Your First Amendment Rights?, 24 JURIMETRICS J. 197, 201-4 (1984).
some patents have been kept secret for over 30 years.\textsuperscript{11} Under the Reagan executive order or the Invention Secrecy Act, information can become classified only by the conscious act of an authorized official, but some information can become classified without anyone’s action. For example, under the Atomic Energy Act,\textsuperscript{12} almost all information related to nuclear energy and nuclear weapons is considered to be “born classified.”\textsuperscript{13} In the \textit{Progressive} case,\textsuperscript{14} a federal district court judge relied on the Atomic Energy Act to enjoin publication of a magazine article describing the workings of a hydrogen bomb, even though the article was based solely on information, such as encyclopedia articles, that was in the public domain.

Usually, information is classifiable only if its release reasonably could be expected to damage national security interests. Given the classification process, it would seem that the release of unclassified information, whether to United States citizens or to foreigners, would be legally permissible. The control of information transfers, however, is not limited to classified information. In recent years, restrictions on the transfer of unclassified information have increased. For example, from 1981 through 1983, the Department of Energy (“DOE”) limited the distribution of about 7\% of the unclassified documents it issued.\textsuperscript{15} The DOE claims authority to control its unclassified information under a section of the Atomic Energy Act\textsuperscript{16} that permits the Secretary of Energy to limit the distribution of documents that may have “a significant adverse effect” on either

\begin{itemize}
\item \textsuperscript{11} These assertions about the Invention Secrecy Act have been taken from Cheh, \textit{supra} note 8, at 12.
\item \textsuperscript{13} 42 U.S.C. § 2274 (1982). "Information in this category is [said to be] 'born classified,' i.e., it is subject to official secrecy protection from the moment of its creation, regardless of where located, and can be removed from its privileged status only by affirmative determination of the government." Relyea, National Security Controls and Scientific Information, Library of Congress Congressional Research Service (June 13, 1983).
\item \textsuperscript{14} United States v. Progressive, Inc., 467 F. Supp. 990 (W.D. Wisc. 1979), \textit{app. dismissed}, 610 F.2d 819 (7th Cir. 1979).
\item \textsuperscript{15} U.S. \textsc{General Accounting Office, Department of Energy’s Activities To Limit Distribution of Certain Unclassified Scientific and Technical Information,} 2-3 (1984) (indexed as GAO/RCED-84-129) [hereinafter cited as DOE REPORT]. For further details concerning this DOE practice, and the objections thereto, see \textsc{36 Physics Today} 43 (1983) and Norman, \textit{Universities Denounce DOE’s Secrecy Rules}, \textsc{221 Science} 932 (1983). Of course, we are concerned here only with information whose release has been withheld for national security reasons even though the information has not been classified. The government customarily withholds unclassified information for a variety of generally well accepted reasons, wholly unrelated to national security, e.g., proprietary information, census and income tax data about named individuals, the identities of juvenile malfeasors, etc.
\item \textsuperscript{16} 42 U.S.C. § 2168 (1982).
\end{itemize}
the public health and safety or the national defense and security. The DOE has admitted that, in general, the "significant adverse effect" standard enables restrictions on the distribution of information which would not be classifiable under the Reagan executive order.

I. Export Control Statutes and Regulations

The abovementioned mechanisms for restricting the transfer of information all make information unavailable to foreign nationals and United States citizens. Under the export controls embodied in various federal statutes and regulations, however, only transfers of information to foreign nationals are restricted. Nevertheless, export controls provide the broadest and most pervasive means under United States law for controlling the transfer of unclassified information by United States citizens. Numerous statutes — for example the Atomic Energy Act, the Trading With the Enemy Act, the Controlled Substances Import and Export Act, and the Endangered Species Act — limit exports from the United States. Two such statutes are particularly significant with respect to the transfer of information: The Export Administration Act of 1979 and its associated Export Administration Regulations (EAR), and the Arms Export Control Act of 1976 and its associated International Traffic

17. Id. § 2168(a)(2).
18. DOE REPORT, supra note 15.
19. 50 U.S.C. app. § 1 (1983). Under this Act, essentially every variety of transaction with the "enemy" is proscribed, including financial transactions and performing or entering into contracts.
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in Arms Regulations (ITAR).23 The ITAR are administered by the State Department. The EAR are administered by the Commerce Department. In practice, potentially controversial export licenses are not granted by these Departments without consultation with other concerned government departments and agencies, such as the Department of Defense. In addition, the United States government coordinates its policies on the control of exports with those of other NATO countries (without Iceland but with Japan) through a multinational coordination committee (COCOM).24

The Arms Export Control Act authorizes the President to control the manufacture and export of "defense articles and defense services." Items which the President designates as defense articles and defense services constitute the United States Munitions list.25 The export of listed items is controlled through a licensing system.26 The Export Administration Act authorizes the President to control the export of goods and technical data to protect national security, to conserve scarce goods and to further foreign policy objectives. To carry out these statutory mandates, the Commerce Department maintains the Commodity Control List,27 which is also the basis for an export licensing system.

The Export Administration Act is concerned with items which have both civilian and military application ("dual use" items); the Arms Export Control Act, by contrast, is concerned only with items having solely military uses ("munitions"). Both of these export acts, it should be stressed, apply to privately generated technical data.

24. COCOM was established in 1949 as a multilateral, consultative organization charged with coordinating export controls for security purposes. It has compiled lists of controlled exports to the Soviet Union, the Warsaw Pact nations, Albania, North Korea, Mongolia, Kampuchea, Vietnam, and China. COCOM reviews its list of controlled items every three or four years. Mally, Technology Transfer Controls, 23 Jurimetrics J. 33 (1982). According to the Bureau of Public Affairs, U.S. Dep't of State, Controlling Transfer of Strategic Technology (1985), COCOM has no formal relationship with NATO, and is not based on any treaty or executive agreement. Its use has increased during the Reagan Administration; recently COCOM has been flooded with applications from businesses hoping to sell technology to China. Wash. Post, Feb. 6, 1985, at A14, col. 1. 50 U.S.C. app. § 2404(i) (1983) directs the President to enter into negotiations with the governments participating in COCOM in order to (1) publish a list of controlled items, (2) hold periodic meetings to discuss export control policy issues, (3) reduce the level of export controls to a level acceptable to and enforceable by all governments participating in the Committee, and (4) develop more effective procedures for enforcing export controls.
26. Very recently the Department of Commerce, rather than the Department of State, appears to have taken export control jurisdiction over the "defense articles" on the Munitions List. 50 Fed. Reg. 3740 (1985).
Unlike the executive orders, application of the export acts is not limited to information "that is owned by, produced by or for, or is under the control of the U.S. government."

It is generally accepted that the President should be able to control the export of munitions or of dual use goods that are likely to be of military use to a hostile power. At first glance, therefore, there is little reason to expect that either of these export acts would seriously burden the kinds of scientific and technical information that researchers on unclassified projects are accustomed to disseminating in specialized journals, in talks at meetings of professional societies, and through private discussions with colleagues.

Indeed, until comparatively recently, these export acts, versions of which date back over thirty years, did not burden researchers because the government employed them primarily to control the export of tangible items, such as equipment, commodities, devices, or any other "goods", as defined by the Uniform Commercial Code. During the past five years or so, however, the government, taking advantage of very broad language in the regulations, has attempted to extend its export controls from well-defined categories of goods to rather vaguely defined categories of scientific and technical information, referred to as "technical data" in the export regulations. For example, Section 379.1 of the EAR defines technical data which may be subject to control as "information of any kind that can be used, or adapted for use, in the design, production, manufacture, utilization, or reconstruction of articles or materials." Section 379.1 also states that export of technical data, for purposes of the regulations, may occur through "oral exchanges of information in the United States or abroad," or through "the application to situations abroad of personal knowledge or technical experience acquired in the United States." Similar definitions of controllable technical data and regulation of their export are found in the ITAR.

30. We are concentrating on the Export Administration and Arms Export Control Acts because these are the statutes on which the government has been relying to control information exports. This reliance stems from the fact that these statutes, unlike the other export statutes referred to earlier, allow peacetime export controls on unclassified information (rather than merely goods) without straining the statutory language. Thus the Export Administration Act routinely distinguishes between "goods" and "technologies," both of which are controlled; 50 U.S.C. app. § 2404(d)(2) requires the Secretary of Defense to develop a list of "militarily critical technologies," including "arrays of design and manufacturing know-how . . . which, if exported, would permit a significant advance in a military system" of the country receiving the export (emphasis added). The Arms Export Control Act routinely distinguishes between "defense articles" and "de-
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The licensing requirements and procedures under the ITAR and EAR are extremely complex. The issuance of export licenses, and the difficulties involved in obtaining them, depend on the content of the particular item and its putative destination. The most difficult licenses to obtain concern potential exports to countries in the Soviet bloc. Furthermore, under both the EAR and the ITAR, a license to export technical data is not required if the technical data are already available in published form. Both the EAR and the ITAR reflect a belief that there is little to be gained by attempting to restrict the dissemination of scientific and technical information that is already widely available. Failure to heed the licensing require-

Language of this kind, permitting controls on the export of information, is not found, nor is it expected, in, e.g., the Endangered Species Act, 16 U.S.C. § 1531 (1983). On the other hand, the government apparently possesses very broad powers to control exports and imports, including information exports, under the section of the Trading With the Enemy Act regulating financial transactions. 50 U.S.C. app. § 5 (1983). In particular, under the authority of this section, the government has promulgated regulations requiring licenses for any transactions involving property in which Cuba, "or any national thereof, has . . . any interest of any nature whatsoever, direct or indirect." Use of these regulations to inhibit the travel of American citizens to Cuba, by forbidding them from paying for any food, lodging, transportation, etc., while in Cuba has been upheld by the Supreme Court. Regan v. Wald, 52 U.S.L.W. 4966 (June 26, 1984). The Court did not even discuss the fact that the United States neither is, nor ever has been at war with Cuba, although the past or present existence of an "at war" relationship is an explicit requisite of the term "enemy" as defined in the Act. 50 U.S.C. app. § 2 (1983). Apparently this issue was settled long ago, by Sardino v. Federal Reserve Bank of New York, 361 F.2d 106, 111-112 (2d Cir. 1965); see United States v. Fernandez-Pertierra, 523 F. Supp. 1135, 1138, no. 9 (S.D. Fla. 1981). The United States Customs, on the strength of these same regulations, has seized publications sent from Cuba to residents of the United States. ACLU, PUBLIC POLICY REPORT 15, FREE TRADE IN IDEAS (1984) [hereinafter cited as ACLU REPORT]. The recently imposed embargo on trade with Nicaragua, including imports and exports, apparently relies on the International Emergency Economic Powers Act, 50 U.S.C. § 1703. N.Y. Times, May 2, 1985, at A8, col. 1.

A recent report by the Comptroller General discusses industry complaints that United States export controls are "cumbersome, inconsistent and unnecessarily rigid." The report points out that in fiscal year 1981 the Commerce Department processed 64,518 export applications covering items controlled for national security reasons. However, Commerce carefully reviewed only 3,735 of these applications. In other words, Commerce carefully reviewed fewer than one out of every seventeen export applications it received. Largely on the basis of this simple fact alone, the report concludes that export licensing requirements are much broader and more restrictive than necessary to protect national security. The report also notes that it costs both industry and the United States millions of dollars per year to process these apparently unnecessary export license applications. U.S. GENERAL ACCOUNTING OFFICE, EXPORT CONTROL REGULATION COULD BE REDUCED WITHOUT AFFECTING NATIONAL SECURITY (1982) (indexed as GAO/ID-82-14).

32. 15 C.F.R. § 379.3(a) (1984).
ments with respect to information which has not been previously published, however, and which can be regarded as "technical data" within the regulatory definitions, can result in very heavy penalties, including a fine of $250,000 and imprisonment for ten years.\textsuperscript{34}

The typical researcher, unversed in the nuances of national security deliberations, finds it extremely difficult to decide whether her research is subject to export controls. The lists of controlled items published pursuant to the export acts are virtually impossible to interpret confidently. For example, the Munitions List is hardly more than a collection of broad headings, in effect a table of contents, which is of little value in determining whether specific research results are subject to control. Details concerning the items on the aforementioned lists, which might make it possible to decide whether specific research results are subject to controls, are likely to be classified\textsuperscript{35} and therefore not available to the baffled researcher.

For example, pursuant to the Export Administration Act, the government has published a list of militarily critical technologies (the MCTL)\textsuperscript{36} whose associated technical data may be subject to control.\textsuperscript{37} The details of the militarily critical technologies, however, are classified. When first published, the unclassified version of the

\begin{itemize}
\item[34.] 15 C.F.R. § 387.1(a)(ii) (1984); 50 U.S.C. app. § 2410 (b)(1) (1983); 22 U.S.C. § 2778(c) 1983; 22 C.F.R. § 127.03 (1984). In general, the penalties for violating the Export Administration Act are more severe than those for violating the Arms Export Control Act.
\item[35.] PANEL ON SCIENTIFIC COMMUNICATION AND NATIONAL SECURITY, COMMITTEE ON SCIENCE, ENGINEERING AND PUBLIC POLICY, NATIONAL ACADEMY OF SCIENCES, SCIENTIFIC COMMUNICATION AND NATIONAL SECURITY, vol. 1, 18 (1982) [hereinafter cited as CORSON REPORT]. A new NAS study, following up on the Corson Report, financed by five federal agencies and a consortium of professional organizations, has very recently been announced. N.Y. Times, May 3, 1985, at A17, col. 1. Apparently this new study is intended to determine the effects of export control policies on the competitiveness of United States industry; the Corson Report concentrated on how export controls affected the exchange of scientific information, especially in academia. 38 PHYSICS TODAY 48 (1985).
\item[37.] Militarily critical technologies are defined by 50 U.S.C. app. § 2404(d)(2)(1983) as follows:
\begin{itemize}
\item[(A)] arrays of design and manufacturing know-how,
\item[(B)] keystone manufacturing, inspection, and test equipment, and
\item[(C)] goods accompanied by sophisticated operation, application, and maintenance know-how
\end{itemize}
which are not possessed by countries to which exports are controlled under this section and which, if exported, would permit a significant advance in a military system of any such country.
\end{itemize}
MCTL merely listed the critical technologies by name.\textsuperscript{38} Under each critical technology the government added "keystone hardware", defined as the "unique hardware components that are necessary for the effective development or application of" the various militarily critical technologies.\textsuperscript{39} A physicist would find it nearly impossible to perform a publishable experiment which did not use any keystone hardware. For example, under "diagnostic technology" — one of the hundreds of critical technologies listed — the keystone hardware listed in 1980 include, \textit{inter alia}: "streak cameras, neutron detectors, gamma detectors, X-ray detectors, fast analog circuitry, fast oscilloscopes, computers, X-ray transmission equipment, spectroscopy equipment, magnetic field measuring equipment, interferometry equipment, and diagnostic lasers."\textsuperscript{40} The newly published unclassified MCTL is much more usefully detailed and imposes fewer restrictions than the original list, but the total number of subjects included remains forbiddingly large to the researcher hoping to improve on previously published results by using the latest advances in experimental techniques. Were the export regulations to be literally enforced, few such researchers working on unclassified projects could feel confident about giving a paper at an international conference without subjecting the paper to pre-publication review.

II. \textit{Illustrative Applications of Export Controls}

The first attempt to use the export acts to restrict the dissemination of scientific information, rather than to control the export of goods, occurred only comparatively recently. During the waning days of the Carter administration, the Commerce Department abruptly intervened in the planning of the International Conference on Bubble Memory, organized by the American Vacuum Society and scheduled to be held in Santa Barbara, California, in February 1980. About a week before the conference was to open, the President of the Vacuum Society received a letter from the Commerce Department. The letter warned:

\textit{[P]resentations to be made at the Conference may fall within the scope of Part 379 (Technical Data) of the U.S. Export Administration Regulations . . . . You are invited to submit to the Office of Export Administration a request for an advisory letter so that we may make a definitive determination as to what restrictions govern the subject mat-}

\textsuperscript{38} 45 Fed. Reg. 65,014 (1980).
\textsuperscript{40} DOD MCTL, \textit{supra} note 36.
ter of the Conference. The request should include submission of copies of the presentations to be made, sources of the information contained in the presentations, and whether the information is proprietary in nature or in the public domain.\footnote{Letter from K.N. Knowles, Director, Office of Export Administration, U.S. Dept. of Commerce to Dr. J.L. Vossen (Feb. 14, 1980).}

Even if one ignores the fact that the letter was received only a week before the Conference was scheduled to open, the fact remains that the recipients of the letter did not have the information requested by the Commerce Department. At scientific conferences, people frequently speak without a prepared text. Even when a paper has been written before the conference, it often is not submitted to the conference chairman until the day of its presentation. It is not possible, moreover, for conference organizers to anticipate how a speaker will respond to questions; and it is difficult for conference organizers to know if the information to be presented is in the public domain. If conference organizers are to be held responsible for improprieties by speakers, few will be willing to organize a conference—a task that often involves a great deal of work and very little glory.

John Vossen, the Vacuum Society President, explained these realities to the Commerce Department, but he was informed that unless the papers received approval before the conference, invitations to participants from the Eastern Bloc must be withdrawn. Failure to comply with the Commerce Department's requirements would be punishable by up to a $10,000 fine, ten years in prison, and an additional fine of five times the value of any equipment seen or demonstrated.

Consequently, invitations to participants from the Soviet Bloc were withdrawn, and the other foreign participants were required to sign a letter of assurance that information obtained at the Conference would not be divulged to Eastern Bloc nationals. The Commerce Department was unpersuaded by the argument that requiring a letter of assurance would make it awkward for American scientific societies to invite foreign scientists to United States conferences and by the warning that distinguished foreign scientists might refuse invitations premised upon a Commerce-imposed censorship of their future scientific associations.\footnote{This material on the 1980 Bubble Memory Conference is based largely on private communications with Dr. Vossen. Much of this story has been previously recounted in Gerjuoy, \textit{Emargo on Ideas: The Reagan Isolationism}, 38 \textit{BULL. ATOM. SCIENTISTS} 31 (1982).}
This interference with the planning of the Vacuum Society Bubble Memory Conference was not an isolated incident; the government has intervened in other scientific conferences, although infrequently. A particularly notorious intervention occurred in August 1982, at the International Congress of the Society of Photo-Optical Instrumentation Engineers in San Diego, California.43 Of 773 papers originally scheduled for presentation at the Congress, about 120 were withdrawn after warnings by the Pentagon that their delivery might violate export regulations.44 Many of the withdrawn papers had, inexplicably, been contributed by the Defense Department's own laboratories: it is difficult to quarrel with the Pentagon's later decision to withdraw permission for their presentation. For example, it is astonishing that permission was originally granted to the Naval Air Development Center to deliver a paper entitled "Reconnaissance in the F/A-18A" or to the Naval Ocean Systems Center for delivery of a paper "Advanced Automation for the Battlefield."45 On the other hand, the papers withdrawn at the behest of the Pentagon included apparently non-military basic research — for example, two papers on atmospheric infrared emissions submitted by a Physics professor at the University of Massachusetts at Amherst. As did the organizers of the 1980 Vacuum Society Conference, this professor received notice of objections to his papers less than one week before the Congress was scheduled to begin.46

Scientific conferences have not been the only forum in which the federal government has relied on export controls to prevent the dissemination of unclassified research results. In December 1981, the National Library of Medicine informed foreign distributors of MEDLINE, a national computerized index of articles taken from some 3000 medical and biomedical journals, that they "should not allow any person from a Communist country to have direct, on-line computer access to the system, unless prior approval had been obtained

43. This Society's acronym caused the Conference to be widely referred to as the SPIES conference. Perhaps this is what drew the government's attention to it.
44. Memorandum to the Secretary of Defense from Fred Ikle, Under Secretary of Defense, Subject: SPIES Congress, 21-27 August 1982 (1982). Recently, April 1985, the DOD again intervened in a SPIES conference; in this case, however, the DOD insisted on the withdrawal of only about a dozen papers. Norman, Security Problems Plague Scientific Meeting, 228 Science 471 (1985).
46. Letter from L.F. Cook to M. Goldhaber, President, American Physical Society (Aug. 27, 1982). At the time, Cook was Chairman of the Department of Physics, University of Massachusetts at Amherst.
from the Commerce Department's Office of Export Administration."  

In addition, about four years ago, the State Department sent many university science departments letters similar to the following communication received by the Physics Department at the University of Pittsburgh:

The Chinese scholar [who was named] at your institution is part of an official US-China exchange program. . . . The United States Government is concerned that none of these programs involve the transfer of technical data which is considered critical on export control or national security grounds. US law and regulations require that the Department of State, together with the relevant US agencies, examine in detail those programs which may involve the transfer of such technical data.

The letter asked the university to complete a questionnaire that included the following questions:

What professional trips might this student or scholar be taking?
What major subject areas will be involved in the scholar or student's program?
Do you — the host professor — or your institution have any contracts with industry or government organizations? If so, please list them and indicate whether the foreign visitor will have any access to contract activities.

The University of Pittsburgh Physics Department received this letter in connection with five Chinese graduate students. It did not complete the questionnaire in detail, but sent the State Department a copy of the department's graduate brochure, along with the statement that the department did not conduct classified research and that all of its graduate students, domestic and foreign, were treated alike. Many university departments made no attempt to comply with the State Department's request. In one case, the State Department asked the University of Minnesota to restrict a Chinese computer science student "from any access to unpublished Government-funded work"; the State Department also requested that his courses

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47. ACLU REPORT, supra note 30, at A-37, quoting Marshall, Medical Data Bank: A Security Risk?, 216 SCIENCE 831 (1982). MEDLINE is an on-line computerized data base maintained by the National Library of Medicine, part of the National Institute of Health. The National Institute of Health is one of the agencies of the U.S. Department of Health and Human Services. According to Science, the Commerce Department feared that a skilled computer operator, once having entered MEDLINE, might be able to jump from this comparatively innocuous (from a national security standpoint) data base to more sensitive computer files.

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involve only minimal applied research. Peter McGrath, president of
the university, responded:

We have all kinds of unpublished government funded research all over
the campus. Your proposal would restrict him from access to all of
it. . . You ask for coursework with minimal involvement in applied
research; I don’t know what you mean by minimal, and I have no idea
how you define applied research. . . . You ask to be informed prior
to any visits to any industrial or research facilities; I can only interpret
this to give us the choice of confining him to the student union, or
contacting you several times a day about his campus itinerary. . . .
Both in principle and in practice, the restrictions proposed in your let-
ter are inappropriate for an American university. . . . Our mission is
teaching, research, and public service, and neither our faculty nor our
administrators were hired to implement government security
actions.49

III. The Research Community’s Reaction to Export Controls

The University of Minnesota’s sharp response reflects a wide-
spread fear that the government is overreacting to reports circulated
by certain sectors of the defense and intelligence communities. Ac-
cording to these reports, the nation’s security interests have been
seriously harmed by past technology transfers, especially to the So-
viet Union. The university research community was especially
frightened by Admiral Bobby Inman’s 1982 speech at the annual
meeting of the American Association for the Advancement of Sci-
ence, this country’s largest organization of American scientists. Ad-
miral Inman, former Deputy Director of the C.I.A., argued for
stringent controls on the export of technical information. Accord-
ing to Inman:

[F]oreign intelligence services . . . are collecting all types of informa-
tion in the U.S. Specific data on technical subjects are high on the
wanted list of every major foreign intelligence service and for good
reasons. . . . In terms of harm to the national interests, it makes little
difference whether the data are copied from technical journals in a li-
brary or given away by a member of our society to an agent of a for-
eign power. . . . One sometimes hears the view that publication
should not be constrained because “the government has not made its
case,” almost always referring to the absence of specific detail for pub-
lic consumption. This reasoning is circular and unreasonable. . . .
Specific details about why information must be protected are more
often than not even more sensitive than the basic technical informa-
tion itself. Publishing examples, reasons and associated details would

certainly damage the nation's interests. Public review and discussion of classified information which supports decisions is not feasible or workable.\(^{50}\)

During the discussion that followed, Admiral Inman noted that unless scientists controlled the "hemorrhage" of sensitive research information, there would be a "tidal wave" of repressive legislation aimed at controlling the publication and release of such information.\(^{51}\)

The assertion that the fact of prior technology transfers to the Soviet Union warrants increased export controls on unclassified scientific and technological research results has been examined carefully by a panel of the National Academy of Sciences, America's most prestigious scientific organization. According to this panel:

> While there has been extensive transfer of U.S. technology of direct military relevance to the Soviet Union from a variety of sources, there is a strong consensus that scientific communication, including that involving the university community, appears to have been a very small part of this transfer up to the present time.\(^{52}\)

The vast majority of Soviet acquisitions of United States technology are obtained through overt and covert intelligence activities, such as legal and illegal purchases of American equipment. According to Admiral Inman, "of the acquisition of information of value to the Soviets,. . .[only] a small percentage comes from the direct technical exchanges conducted by scientists and by students."\(^{53}\)

However, Admiral Inman and others in the intelligence and defense communities believe that "there is now a clear trend toward a greater Soviet effort to acquire information about technologies from universities and other research institutions";\(^{54}\) it is this new threat, so the argument goes, that justifies broader application of export controls.

The National Academy of Sciences panel concluded that it is not yet possible to usefully evaluate the significance of this purported

\(^{50}\) Inman in Symposium, Striking a Balance: Scientific Freedom and National Security, at the Annual Meeting AAAS, Washington, D.C. (Jan. 7, 1982); the full text of the talk has been reprinted, AVIATION WEEK AND SPACE TECH., Feb. 8, 1982, at 10 [hereinafter cited as AAAS Symposium.]


\(^{52}\) CORSON REPORT, supra note 35, at 17.

\(^{53}\) Impact of National Security Considerations on Science and Technology: Hearings Before the Subcoms. on Science, Research and Technology and Investigations and Oversight of the House Committee on Science and Technology, 97th Cong., 2d Sess. 6-7 (1982) (testimony of Admiral Inman) [hereinafter cited as Hearings].

\(^{54}\) CORSON REPORT, supra note 35, at 23.
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new threat. According to its report, "a useful forecast can[not] be made at present concerning the future proportion of leakage to the Soviet bloc through scientific communication."\(^5\)

Because the intelligence and defense communities point to university research as a major potential source of future leakage of technology to the Soviet Union, and because university researchers are less accustomed than their industrial counterparts to restrictions on the dissemination of research results, this article has thus far concentrated on the reaction of the university community to the government's new focus on the enforcement of restrictions on the export of technical data. Industrial researchers, unlike university researchers, are commonly obliged to submit manuscripts to their superiors for pre-publication review; such requirements are necessary to ensure that information about patentable inventions and trade secrets is not released. Because of these dissimilar traditions, university researchers appear to have argued more forcefully against export controls on technical data than have their industrial counterparts.\(^56\)

The industrial research community, however, is affected by, and opposes, controls on the export of technical data. High-technology companies with many international affiliates, such as IBM or RCA, find such controls particularly obstructive; if read literally, the export regulations would prevent the free flow of information between domestic and foreign branches within the same company.\(^57\) During the August 1984 Annual Meeting of the American Bar Association in Chicago, Daniel O'Neill,\(^58\) a panelist at a session entitled "Controls on Scientific Information Exports: Have We Been Giving Away the Store?", presented the views of private industry. He denounced the government's use of export controls to limit transfers of technical data, claiming that the use of such export controls is a severe and unnecessary barrier to the economic survival of high-technology companies. Similar criticisms have been voiced by David Packard, Chairman of the Board of the Hewlett-Packard Company and Deputy Secretary of Defense under President Nixon:

I cannot resist the temptation to comment at this point on the grossly misguided current proposal by our Defense Department to censor the

\(^{55}\) Id. at 25.


\(^{57}\) Wallich, supra note 56, at 70. See also supra note 35.

\(^{58}\) Mr. O'Neill is chairman of the ABA Section of Science and Technology's Government Policy and Regulation Division.
publication of the results of basic research funded by the Department at U.S. universities. They are . . . proposing to restrict technology transfer between the United States divisions and foreign divisions of international companies. I am quite certain that these proposals, if carried out, will do considerable damage to the advancement of all technology in the United States including technology useful for military purposes. It will not seriously hamper the Soviets in their progress in technology for military equipment unless an impregnable barrier can be placed around the Soviet Union and this, of course, is impossible. To put the matter in plain English, the current effort of the Defense Department to censor basic research in the United States is simply stupid. 59

Joint research ventures involving the academy and private industry increasingly include the imposition of patent and trade secret restrictions on university research. 60 Many universities, including Brown, M.I.T., Stanford, Carnegie-Mellon, and the University of Texas, have accepted contracts from IBM and other large computer companies that impose restrictions on the publication of research results. 61 The University of Tulsa has participated in industry-supported research consortia that permit the sponsor to delay the publication of research results for up to two years. 62

The increasing willingness of universities to accept such constraints weakens university arguments against the government's imposition of export controls on the results of scientific research, as Admiral Inman pointed out in his 1982 talk to the AAAS. 63 There is a genuine difference, however, between pre-publication requirements imposed by the government and those negotiated by university and industry in their joint research ventures. Violation of the former is punishable by criminal penalties, whereas breach of the latter type of agreement can be punished only through imposition of damages. Moreover, according to Robert M. Rosenzweig, President of the Association of American Universities:

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60. See, e.g., Smith, Industry-University Research Programs, 37 Physics Today 24 (1984). Smith, Associate Provost and Vice President for Research at the Massachusetts Institute of Technology, explains that at M.I.T., the industrial sponsor of joint university-industry projects is granted a 30-day pre-publication review "so that the sponsor can guard against inadvertent disclosure of proprietary information." Id. at 37.


63. AAAS Symposium, supra note 50. According to Admiral Inman, "scientists' blanket claims of scientific freedom are somewhat disingenuous in light of the arrangements that academicians routinely make with private, corporate sources of funding. For example, academicians do not seem to have any serious difficulty with restrictions on publications that arise from a corporate concern for trade secret protection." Id. at 11.

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It is important to distinguish the kind of publication delay discussed here [requested by industrial sponsors of university research] from that which some government agencies have on occasion sought to impose. To the extent that the purpose of review and delay is to determine whether a piece should be published, in whole or in part, it should be unacceptable to a scientist and a university. However, delays for the purpose of identifying patentable inventions and filing them on a timely basis, delays in which the form and content of the publication remain in the discretion of the author — such delays ought not to cause difficulty.64

Compliance with export regulations can be very difficult for universities and for university researchers. The regulations are complex and vague; more importantly, as President McGrath of the University of Minnesota alluded, effective compliance with the export regulations would profoundly restrict the freedom of academicians to discuss research with colleagues and students, a freedom that lies at the heart of the modern American university and American academic tradition.

Because the export controls impose great burdens and uncertainties on universities and university researchers, spokesmen for the academic research community have suggested that the government simply classify the information it does not want disseminated.65 Researchers who do not wish to have the dissemination of their research findings restricted by the government could choose to work only on unclassified projects. In fact, most universities will not accept classified research contracts on their main campuses because of the incompatibility of classification and customary university freedom. The export regulations, due to their vagueness and broad scope, are much more difficult to comply with than are restrictions imposed by classification.

IV. Do Controls on Technical Data Exports Enhance United States Security?

Even assuming that technology leakage to the Soviet Union through scientific communication poses an increased threat, it remains questionable whether stricter enforcement of controls on the export of technical data will enhance the security of the United States. More specifically, will the benefits from reduced technology

64. Rosenzweig, Research as Intellectual Property: Influences Within the University, 10 Sci., Tech., & Human Values, 41, 48 (1985)
leakage outweigh the detrimental effects of export controls on this nation's scientific research practices? The available facts do not reveal conclusive answers to these questions. Responses tend to be based on individual experiences and prejudices, rather than on hard data.

I do not believe that stricter controls on technical data will enhance our national security, but the contrary view is not clearly inconsistent with available facts. Certainly, this contrary view is held by many well-informed, intelligent persons who are dedicated to the national welfare and who do not seem to harbor any hidden agenda. Nonetheless, the arguments against increased export controls, especially with respect to university scientific research, are persuasive. Research institutions of Western Europe and Japan are competitive with those in the United States. Therefore, unless Japan and our Western allies can be persuaded to withhold technical data from the Soviets, our export controls will limit our own export trade while simultaneously hindering our scientists' attempts at fruitful collaboration with their Western and Japanese colleagues. American university research, moreover, is dependent upon foreign graduate students and post-doctoral students, due to the recent flight of American undergraduates from mathematics, science and technology. For instance, in 1983, 56 percent of all United States engineering Ph.D.'s were awarded to foreign students; already by 1980 one third of all science and engineering post-doctoral students employed in university research were foreign. Insistence that American university professors discontinue communication of technical data to foreigners, therefore, would severely reduce the research output of our universities.

Other arguments against export controls concern the alleged impracticality of attempting rigorously to enforce the export regulations against universities. One telling point, made again and again

66. Or, as Packard put it, "[It will not work] unless an impregnable barrier can be placed around the Soviet Union." Packard, supra note 59.
67. This assertion would hold true even if in the majority of cases the government granted American scientists the export licenses they required to lawfully communicate technical data to their foreign colleagues. The delays, awkwardnesses, red tape and potential penalties of "export-controlled" collaborations would surely make such collaborations unattractive to both American and foreign scientists.
69. OFFICE OF THE UNDERSECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING, DEFENSE SCIENCE BOARD TASK FORCE REPORT ON UNIVERSITY RESPONSIVENESS TO NATIONAL SECURITY REQUIREMENTS, 2-8 (Jan. 19, 1982) [hereinafter cited as DSB REPORT].
70. For example, controlling the direct "export" of technical data to foreigners is pointless if the same data are readily accessible in public and university libraries. Thus, as Admiral Inman recognized, technical data export controls must be accompanied by
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by opponents of increased export controls,\textsuperscript{71} is that all available evidence indicates that the Soviet Union's scientific research output has been very seriously weakened by the stringent controls the U.S.S.R. imposes on its scientific publications. The vast bulk of our basic research is freely available to Soviet scientists, while Americans are permitted to glimpse only that research which the KGB is willing to release. Nevertheless, by most accepted criteria — numbers of Nobel Prizes awarded, scientific papers published, significant inventions, high-technology items, and new medicines discovered — the United States continues to be far ahead of the Soviet Union scientifically, although in certain scientific subfields the Soviets compete favorably. There has been a recent quantitative study of the worldwide impact of Soviet science, as measured by the number and nature of journal citations to Soviet papers in the \textit{Science Citation Index}, a publication that monitors citations to scientific journals, domestic and foreign, in 128 different scientific fields. In all, the impact of Soviet journals in 1981 (the last year studied) was far below that of United States journals, as well as that of the journals of most Western nations.\textsuperscript{72}


\textsuperscript{72} LaBrie and Sessler, \textit{The Impact on World Science of Soviet Science as Measured by Journal Citations in 1975 and 1981}, University of California Lawrence Berkeley Laboratory
Further evidence that the openness of American society has enhanced, rather than hindered, American scientific superiority is the flow of technical information from the United States to the Soviet Union, eagerly fostered by the Soviets — the very reason the United States government gives for the proposed export controls. No one seriously suggests that American scientists would as eagerly seek to acquire Soviet technical information as the Soviets seek American technical information, were a more open scientific atmosphere to prevail in the Soviet Union. Soviet refugees, admittedly not the most objective sources, speak regularly of the poor scientific results and low morale among researchers in the typical Soviet scientific institute, consequences engendered by the pervasive restrictions on communications. For example, Mark Popovskiy, formerly a science writer in the Soviet Union, has written that:

"Secrecy is the main product of hundreds of Soviet research and development institutes, and may be called the lifeblood of Soviet science. The staff of an institute may turn out inferior products at huge expense, so slowly that the equipment is obsolete before it comes into use, and nobody will turn a hair . . . but God help them if there had been any security breach or leakage of information . . . ."

A Moscow mathematician is credited with a much repeated saying: "Secrecy in Soviet conditions is the one way of concealing our scientists' shortcomings . . . ."

Dr. R. . . . is not a cynic, . . . but he too is convinced that Russia has lost the race with the West . . . since scholars and scientists cannot work properly in an atmosphere of forced conformity and bureaucratic supervision. It is also worth mentioning that the opposition to increased export controls includes scientists not often accused of being soft on the Soviet threat to this nation, such as Edward Teller.

A little-known story concerning the early history of the laser will illustrate the point that the openness of our scientific communication is a national strength, not a weakness. The first paper to describe how a laser might be built was published in December 1958 by Arthur Schawlow and Charles Townes in the Physical Review, the leading American journal of general physics. At the time, the paper (Mar. 10, 1983), summarized in Holden, Russian Influence in Science Diminishing, 223 Science 1155 (1984).

74. See Ember, Chem. and Eng. News, Apr. 5, 1982 at 10. Dr. Teller is the co-inventor of the hydrogen bomb. He was one of the very few scientists to testify against J. Robert Oppenheimer at the hearings which culminated in the revocation of Oppenheimer's security clearance. See also, N.Y. Times, July 14, 1981, at C4, col. 1.
per's authors, along with their colleagues at Bell Laboratories and at Columbia University, thought that actual construction of a working laser would be difficult, if not impossible. Schawlow, who later received a Nobel Prize for inventing the laser, made a desultory attempt to construct an operating laser, but soon abandoned the effort and moved on to other projects. Much to his surprise, therefore, by mid-1960 the development of an operating laser was announced by a group with whom Schawlow had never been in contact, a group housed at the Hughes Aircraft Company's research laboratories in Malibu, California. Once the Hughes group had shown that it could be done, other groups immediately set out with assurance to construct lasers. Before the end of 1960, no fewer than five different kinds of operating lasers had been demonstrated, one developed by Schawlow himself at Bell Labs.

It is doubtful that dissemination of that first Schawlow-Townes paper to foreign nations would have been prevented by any but the most pervasive, all-encompassing regime of export controls: at the time of publication there was little confidence that lasers could be built and hardly an inkling of their capabilities.

Would restriction of the publication of the Schawlow-Townes paper in 1958 have enhanced the security of the United States? Any answer to this question is speculative, of course, but one is hard pressed to answer in the affirmative. The rapid development by American physicists of an operating laser, made possible by the wide circulation of the Schawlow-Townes paper, enabled the United States to take the lead in many important new technologies, including retinal surgery and the manufacture of computer chips. Indeed, the laser industry makes a substantial contribution to this country’s export trade. To be sure, lasers have military applications as well, of which both the United States and the Soviet Union have taken advantage. It seems unlikely, however, that restrictions on the circulation of the Schawlow-Townes paper would have better guaranteed United States precedence in laser construction than uninhibited circulation of the paper and reliance upon the rapid response of the open scientific community to keep the United States in the forefront of any useful research by-products. In fact, the most likely consequence of a ban on the publication of the Schawlow-Townes paper would have been the independent invention of the laser by a West-
ern European or Japanese scientist, who would then have published the invention for both Soviet and American scientists to see.

V. Are Export Controls Unconstitutional?

While there is reason to believe that it would be unwise from a policy perspective to enforce strict technical data export controls, such controls may be unconstitutional as well. I believe that the wisdom of the controls is the primary issue, because the courts are unlikely to decide that export controls are unconstitutional exercises of the government’s obvious duty to protect the national security unless they question the wisdom of those controls. The foregoing is a prediction, however, not a legal analysis, and it is far from being the accepted view of legal scholars. The constitutionality of export controls remains an open question.77

Insofar as they require a license before previously unpublished technical data may be exported, the regulations constitute a system of prior restraint on communication,78 which the First Amendment was intended to prevent.79 It is not settled, however, that the communication of technical data deserves full First Amendment protection. Technical data controlled under ITAR allegedly have only military potential; in other words, they are not “dual use”. There seems no reason why controls on the dissemination of such technical data would threaten the values commonly believed to underlie the free speech guarantee, such as the right of each citizen to receive

77. The following discussion of constitutionality relies heavily on the previously cited papers by Cheh, supra note 8 and by Greenstein, supra note 8, as well as on Greenstein, supra note 28 and Ferguson, Scientific Freedom, National Security, and the First Amendment, 221 SCIENCE 620 (1983). Use has also been made of the following privately communicated unpublished documents on file with the Yale Law & Policy Review: Relyea, supra note 13; Olson, Re: Constitutionality of the Proposed Revision of the Technical Data Provisions of the ITAR, Department of Justice Memorandum (July 1, 1981); Olson, Re: Export Administration Regulations, Department of Justice Memorandum (July 28, 1981); Meserve, National Security Restrictions on Scientific Communication: Publish and Perish? (Apr. 20, 1983). The excellent analysis by Ferguson, National Security Controls on Technological Knowledge: A Constitutional Perspective, 10 SCI. TECH. & HUMAN VALUES 87 (1985) was published after the completion of this manuscript.


79. According to Professor Tribe, “When the first amendment was approved by the First Congress, it was undoubtedly intended to prevent government’s imposition of any system of prior restraints similar to the English licensing system under which nothing could be printed without the approval of the state or church authorities.” L. TRIBE, AMERICAN CONSTITUTIONAL LAW 724 (1978). “Indeed a common view had been that the first amendment was designed to forbid nothing but such restraints.” Id. (citing Emerson, supra note 78). See also Near v. Minnesota ex rel Olson, 283 U.S. at 713.
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the socially useful information she needs to properly address important policy issues.\textsuperscript{80} This assertion is consistent with the one case on point, \textit{United States v. Edler},\textsuperscript{81} which held the ITAR could be applied to technical data "significantly and directly related to specific articles on the Munitions List."\textsuperscript{82} Similarly, even "dual use" technical data may not deserve full First Amendment protection; for instance such data may be so closely related to commercial transactions, such as the sale of a computer, as to merit only that lesser protection afforded "commercial speech".\textsuperscript{83}

Nevertheless, much dual use technical data are likely to be "basic scientific research information", which is not classifiable under President Reagan's Executive Order unless clearly related to the national security. We do not really know how definitively to distinguish basic from applied research, as was noted by the President of the University of Minnesota. Assume, however, that one can make this distinction. Further, assume that the constitutional challenge is limited to licensing requirements on basic scientific research results — for example, on the papers dealing with atmospheric infrared emission which the Amherst Physics professor was compelled to withdraw from the SPIES Congress. It is still not clear that the communication of such basic scientific research results deserves full First Amendment protection. The courts simply have not confronted this issue.\textsuperscript{84} However, \textit{Edler}\textsuperscript{85} can be read to mean that "disembodied" scientific information — scientific information that is only remotely or indirectly related to any controlled goods — is beyond the reach of the export regulations.

Those authorities who have addressed the constitutionality of export controls maintain that basic scientific research results deserve the same full measure of First Amendment protection as is given to political expression. If the courts agree, the government will have to demonstrate a compelling state interest in the export regulations in order to justify the prior restraint imposed by export licensing requirements. Such justification would probably require a showing that grave and irreparable harm to the national security would be

\textsuperscript{80} Virginia State Bd. of Pharmacy v. Virginia Citizens Consumer Council, 425 U.S. 748 (1976); Ferguson, supra note 77.
\textsuperscript{81} 579 F.2d 516 (9th Cir. 1978).
\textsuperscript{82} Id. at 521.
\textsuperscript{83} Ohralik v. Ohio State Bar Ass'n., 436 U.S. 447 (1978); see also L. Tribe, supra note 79, at 655-56.
\textsuperscript{84} See supra note 77; see also Robertson, \textit{The Scientist's Right to Research: A Constitutional Analysis}, 51 S. Cal. L. Rev. 1203 (1978).
\textsuperscript{85} 579 F.2d 516.
likely to result from failure to enforce pre-publication review.\textsuperscript{86} The federal government would also have to show that there was no less restrictive alternative means of protecting national security.

This standard of review would impose a very heavy burden on the government.\textsuperscript{87} Nevertheless, I believe that if the government could convince the present Supreme Court that pre-publication review of basic scientific research is wise policy, then the government would also succeed in convincing the Court that it had met its burden. Some legal authorities, however, appear unwilling to make so categorical an assertion about the Court's probable attitude toward pre-publication review. But legal authorities are often ignorant about science and technology. The government should be able to argue convincingly that basic research results can have important national security implications that might not be recognized by the typical American university researcher unacquainted with national defense problems.

For instance, the government might point to the problem of maintaining the invulnerability of our nuclear submarine fleet, upon which is based much of our nuclear deterrent capability. A primary component of this invulnerability is the fact that water, although it looks transparent in a drinking glass or swimming pool, is actually an effective absorber of visible light, so that detection of submarines at distances greater than a few hundred yards requires the use of sonar, a technique with many deficiencies.\textsuperscript{88} It is conceivable, however, that within the broad visible light absorption band of water there are very narrow non-absorbing "windows", which heretofore would not have been discovered because, for example, very narrow band light sources such as lasers were unavailable. Therefore, the


\textsuperscript{87} The above-stated "compelling state interest" standard, with its subordinate requirement that the government show it has no less restrictive means than pre-publication review of preventing grave and irreparable harm to the national security, is in effect the standard Tribe enunciates for constitutional analysis of content-based restrictions on communicative activity. L. Tribe, supra note 79, at 602. The burden of justifying prior restraint imposed on the government by this standard is no less than the "national security exception" burden the Near court was willing to allow the government. It is doubtful that the present Supreme Court would impose a heavier burden than the Near Court would accept. Near v. Minnesota, 283 U.S. at 716-17. The Court in the Progressive case relied on the Near national security exception in its opinion enjoining the magazine from publishing an article describing how a hydrogen bomb is manufactured and assembled, although the article's author had not received or made use of any formally classified documents. United States v. Progressive, Inc., 467 F. Supp. 990, 996 (W.D. Wis. 1979).

government might well argue, it is possible that a modern university researcher, re-measuring the absorption properties of water with the far more sensitive equipment available today, could happen upon such a window. If a researcher quite innocently were to publish such experimental results, the consequences for our submarines' invulnerability could be disastrous. Using lasers tuned to the window frequency, the Soviets would be able to construct the equivalent of powerful searchlights which, when placed on their own submarines or on other underwater detectors, could locate and track our submarines over distances of hundreds, perhaps even thousands of miles.

It is likely that the government could produce enough illustrations of this sort to convince the Supreme Court that there is a compelling national security interest that would justify the imposition of pre-publication review on basic research results to determine whether an export license should be granted. The government also should have little difficulty in convincing the Court that such review — which should involve only minimal delays in publication for the vast majority of papers — would not be unduly restrictive, particularly since universities have evidenced their willingness, in joint research ventures with private industry, to tolerate the research delays and disruptions caused by pre-publication review. Recently the Department of Defense has implemented a policy of requiring many of its research contractors to sign a contract clause accepting pre-publication review, in part to avoid having to meet the compelling

89. The Department of Defense has suggested that a researcher could be allowed to publish his results if the government makes no objections within 60 days of receipt of the pre-publication manuscript. DSB REPORT, supra note 69, at Chapter 4.

90. Of course, publication of those very few "dangerous" basic research papers, e.g., the paper hypothesized earlier describing the discovery of windows in the visible light absorption band of water, would have to be delayed for extended periods; otherwise there would be no point to the entire expensive, bureaucracy-generating pre-publication review effort. But the government would argue, now quite correctly in my opinion, that — whatever might be the harm caused to American science by a comprehensive scheme of pre-publication review — the extended withholding from publication of a very small fraction of basic research papers would not significantly increase that harm. As for the constitutionality of suppressing the publication of the few "dangerous" basic scientific papers, this should be easier for the government to justify than pre-publication review of all (or a wide class of) basic research papers; if the Court is willing to accept a significant disruption of American science on the basis of hypothetical illustrations of dangerous research results, then the Court should be willing to accept the much more minor disruption stemming from withholding publication of just a few papers, where this latter disruption rests on actual (not hypothesized) identifiably dangerous research results. In fact, if the national security implications indeed can be recognized at the basic research stage (as was not possible with the laser, for example) the government should be able to justify classification of those basic research results under the Reagan Executive Order, assuming that the research has been performed with government funds.
state interest standard in a judicial proceeding. There has been as yet no court test of pre-publication review provisions for federal contractors. I believe the lesson of Snepp v. United States is that the Burger Supreme Court will uphold contractually agreed-upon pre-publication review in the context of the government's assertion that national security interests are involved. Again, however, this view is more categorical than that which some specialists on the legalities of technical data controls have been willing to take. To summarize, I believe that if the Supreme Court is convinced export controls represent wise government policy, then the Court will be willing and able to uphold even those features of export controls which impose prior restraints on basic research publication, without unduly stretching the presently accepted compelling state interest standard for the constitutionality of content-based restrictions on the freedom to communicate.

VI. Reconciliation of Opposing Export Control Views

Despite the wide differences in outlook between academic researchers like Peter McGrath and defense specialists like Admiral Inman, a reconciliation of their views apparently is possible. A recent article by David Wilson describes at length how such a compromise has developed.

91. DSB REPORT, supra note 69, at 4-1 to 4-11. The Report recommends that many research contractors be explicitly limited to employing only U.S. citizens or permanent immigrant aliens, and further recommends that other federal agencies supporting research be urged to negotiate similar contracts. See also Greenstein, supra note 8.


93. Snepp was a former CIA employee. When he accepted employment he signed an agreement promising not to publish "any information or material relating to the Agency, its activities or intelligence activities generally, either during or after the term of [his] employment... without specific prior approval by the agency." This was part of a general agreement not to disclose classified material related to the Agency without its authorization. Id. at 508. Snepp published a book about the CIA without asking for a pre-publication review. The government conceded that Snepp's book divulged no classified intelligence. Nevertheless, the Supreme Court, declaring that Snepp had breached a voluntarily entered-into contract, imposed a constructive trust on Snepp's proceeds from his book and enjoined Snepp from publishing without pre-publication review. On this basis, I believe the Court would uphold a university professor's voluntarily entered-into contract to submit his research results for pre-publication review in return for receiving governmental research support. A professor, employed by a university, and not dependent on the government for his salary, hardly has more equitable claims than did Snepp, who when hired had to either accept the government's terms or find another job.

94. Greenstein, supra note 28. Ferguson, however, appears to agree that Snepp suggests that the Supreme Court will uphold pre-publication review of federally supported basic research. Supra note 77.

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In early 1982, Richard DeLauer, then Undersecretary of Defense for Research and Engineering, commissioned what became known as the DOD-University Forum, a group consisting of university presidents and Department of Defense ("DOD") officials. A prime objective of the Forum was the development of export control policies acceptable to both the DOD and the academy; to this end a "Working Group on Export Controls" was formed. The Group's deliberations rested heavily on the National Academy of Sciences' previously released Corson Report, which had been co-sponsored by Dr. DeLauer.96

As described by Dr. Wilson,97 co-chairman of the working group, DOD officials ultimately accepted the view of the academic community that strict controls on the dissemination of unclassifiable basic research would not be the best way to serve this nation's security needs. This conclusion was expressed in the following statement issued in June 1984:

> It is the policy of this administration that the mechanism for control of fundamental research in science and engineering at universities and federal laboratories is classification. Each federal government agency is responsible for: a) determining whether classification is appropriate prior to the award of a research grant or contract and, if so, controlling the research results through standard classification procedures; b) periodically reviewing all research grants or contracts for potential classification. No restrictions may be placed upon the conduct or reporting of research that has not received national security classification.98

This DOD statement uses the terminology "fundamental research" rather than "basic research," but it fails to define the "fundamental research" category to which the classification procedures apply. DeLauer resolved this ambiguity in a memorandum issued October 1, 1984.99 This memorandum makes clear that "fundamental research" means research supported by DOD's 6.1 budget category, the category commonly referred to as basic research. The memorandum further states that "unclassified research performed on campus at a university and supported by 6.2 funding (the budget category corresponding to applied research) shall with rare exceptions be considered fundamental and therefore exempt from restrictions." Moreover, it has been reported that the White House is considering requiring all federal agencies to follow DOD's June

96. Id.
97. Id.
98. Id. See also Walsh, DOD Springs Surprise on Secrecy Rules, 224 SCIENCE 1081 (1984).
These developments are consistent with recent changes involving the EAR and the ITAR. A proposed revision of the EAR that would have greatly increased export controls on university science was leaked in February 1984. This proposed revision would, for example, have explicitly required a university professor to obtain an export license before delivering lectures containing technical data in a regular university course attended by foreign students. Present regulations impose no such requirement. The February 1984 draft EAR seems to have been quietly dropped, however, after prompting sharp objections from the academic community.

An October 10, 1984 draft of a revised section 379.3 of the EAR, specifying the technical data that may be exported without an export license, appears to impose considerably fewer restrictions on the export of university research than the language of the present EAR. Indeed, the language in this draft, if retained in the final version, would greatly alleviate the uncertainty confronting university researchers attempting to comply with the Export Administration Act. Similarly, a recent revision of the ITAR appears at first glance to be not significantly stricter than before, although certain definitions — those of “technical data” and “export” — have been modified somewhat from the corresponding definitions in the previous ITAR.

On the other hand, the October draft of EAR section 379.3 explicitly withholds permission to export without applying for a license from university researchers funded by the U.S. government when “specific national security controls . . . are agreed on in the funding instrument to protect information resulting from the research.” Examples of controls include:

- prepublication review by the Government, with or without right to withhold permission for publication; restrictions on pre-publication

100. Id.
101. According to EAR draft § 379.3, titled “Technical Data Available to All Destinations,” unrestricted export is permitted, inter alia, of “information resulting from fundamental research.” “Fundamental research” is defined as basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and production utilization, the results of which ordinarily are restricted for proprietary or security reasons. Moreover, this draft regulation explicitly states, “Research conducted by scientists or engineers working for a university normally will be considered fundamental research.” Draft EAR § 379.3 (Oct. 10, 1984). For a summary and analysis of this draft regulation, see SCIENTIFIC FREEDOM AND NATIONAL SECURITY, Dec. 1984, at 2.
103. 22 C.F.R. §§ 125.01, 125.03 (1984).
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dissemination of information to noncitizens or other categories of persons; or restrictions on participation of non-citizens or other categories of persons in the research.\textsuperscript{104}

Evidently the authors of the newly drafted EAR section 379.3, though nominally removing export controls on the bulk of university research, expect that much federally supported university research (and therefore, a large portion of all university basic research)\textsuperscript{105} will remain subject to export controls via contractual provisions which the researcher will have to accept in order to receive federal funding.

However, if the DOD's June 1984 policy were adopted by all federal agencies, then no academic conducting unclassified basic research with federal funds need fear that dissemination of previously unpublished results to foreign scientists would violate the export regulations. Once the contracting agency had decided not to classify the research, the scientist would not, for example, need to pore over the arcane contents of the militarily critical technologies list, nor worry that the government might force her to withdraw at the last moment a paper scheduled for delivery at a foreign scientific conference. In other words, the DOD policy places on the government, not on the academic, the responsibility for deciding whether research results are sensitive enough to require export licenses or other restrictions. In accepting this responsibility, the authors of that policy presumably agreed with the university research community's contention that pre-publication review of all federally supported basic research would turn up far too few publications meriting export controls to justify the attendant adverse effects on science in the United States.

The logic underlying this immediately preceding assertion becomes more apparent upon reconsideration of the previously described example concerning the absorption of visible light by water. It is extremely unlikely that a previously undiscovered narrow spectral window exists in water;\textsuperscript{106} thus, research on the absorptive properties of water is unlikely ever to affect national security by rendering submarines vulnerable to underwater detection. The possi-

\textsuperscript{104} See supra note 101.

\textsuperscript{105} Nat'L Sci. Foundation Division of Science Resource Studies, Early Release of Summary Statistics on Academic Science/Engineering Resources, Table 1 (Nov. 1984).

bility of constructing this hypothetical, and of other equally unlikely scenarios illustrating the potential military applications of basic research results which might be obtained on normally unclassified research projects, stems from the profound dependence of modern military technology on the sciences. The fact that a basic research outcome whose publication would be harmful to our national security is conceivable does not mean the outcome is probable. Correspondingly, an intrusive regulation of basic science which rests on fear of remotely conceivable scenarios has little likelihood of enhancing the national security. In fact, as the early history of the laser illustrates, military applications of basic research are much more likely to evolve from research results whose military implications are not immediately appreciated than from highly improbable discoveries having immediately recognizable military implications. To significantly reduce the chance that the Soviet military establishment will eventually profit from our published research, our government would have to emulate the Soviet Union and restrict the export of most of the nation's basic research; pre-publication review of all basic research results, with export controls on the small fraction of proposed publications whose military implications are immediately recognizable, would not be effective, even if constitutional.

VII. The Future of Export Controls

The June 1984 DOD policy statement pertains only to federally supported research. Although the government's share of national expenditures on basic research has steadily increased in recent years, much basic research receives no federal funding. For such projects, the responsibility for deciding whether research results may be lawfully disseminated appears to remain with the researcher, even if the research is unclassified. Moreover, as Professor Wilson points out, neither the EAR nor the ITAR provides a blanket exemption from licensing requirements to basic researchers working on unclassified projects supported by federal funds. Until the June 1984 DOD policy on basic research is explicitly incorporated into the EAR and ITAR, even federally supported unclassified basic research results will remain subject to export controls in principle, though the present trends in the EAR and ITAR suggest the gov-

107. See supra note 105.
108. See supra note 95. The draft EAR § 379.3, but not the newly promulgated ITAR, does give such blanket exemption to a federally supported basic researcher who has not agreed to "specific national security controls". See supra note 101.
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gernment presently would not require licenses for such research. These uncertainties in the scope of the June 1984 policy statement may account for the recent exclusion of foreign nationals from some or all sessions at recent American scientific conferences. The exclusions are, at the very least, examples of the chilling effect on scientific interchange which critics have warned will result from restrictive export controls.

Other recent developments at DOD and the Commerce Department reflect a more hospitable attitude toward restrictions. Under a new DOD directive, DOD may require federal contractors to withhold from public disclosure unclassified technical data “that disclose critical technology with military or space application”; the directive makes no reference to the June 1984 policy statement, or to DOD’s 6.1 budget category. The authority for the new directive is an amendment to the 1984 DOD Authorization Act which permits the Secretary of Defense to:

withhold from public disclosure, notwithstanding any other provision of law, any technical data with military or space application in the possession of, or under the control of, the Department of Defense, if such data may not be exported lawfully without an approval, authorization, or license under the Export Administration Act or the Arms Export Control Act.

The broad language of this amendment, taken together with its implementation in the new DOD directive, extends the reach of export controls to technical data transfers within the United States to

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109. Norman, *Mixed Signals on Export Controls*, 226 SCIENCE 1295 (1984); *Scientific Freedom and National Security*, Mar. 1985, at 3. These conferences include those of the American Astronautical Society (October 1984), the Society for the Advancement of Material and Process Engineering (October 1984), the Society of Manufacturing Engineers (January 1985), and again, the SPIES Society of Photo-Optical Instrumentation Engineers (April 1985), where the restricted sessions were held at DOD insistence. Norman, *Security Problems Plague Scientific Meeting*, 228 SCIENCE 471 (1985). It is likely that these conferences concentrated on applied rather than basic research. But as the highly applied 1982 SPIES Congress, discussed earlier see *supra* notes 43-46, demonstrates, it is also likely that the restricted sessions at these conferences included papers on seemingly non-military basic research.


American citizens, even though the Export Acts themselves only restrict technical data transfers to foreign nationals.

Furthermore, Secretary of Commerce Malcolm Baldrige, in a recent memorandum to various government officials, including the Secretary of State and the Secretary of Defense, has advocated wider use of export controls.\textsuperscript{112} Secretary Baldrige, echoing Admiral Inman’s phrase about the “hemorrhage” of research information to our adversaries,\textsuperscript{113} proposed “new legislation, new Executive Orders, and coordinated government-wide regulations” to limit the availability of unclassified documents now made public by the Commerce Department’s National Technical Information Service.\textsuperscript{114}

One further development may also portend stricter regulation. In January 1985, DeLauer, the principal proponent of the June 1984 policy,\textsuperscript{115} resigned from his position at DOD and returned to private life.\textsuperscript{116} Opposition to the June 1984 policy statement, bitter at the time,\textsuperscript{117} certainly has not ended.\textsuperscript{118} In any event, given the Reagan Administration’s past efforts to preserve government secrecy,\textsuperscript{119} it is clear that the final chapter on the control of scientific information exports remains to be written.\textsuperscript{120}

\textsuperscript{112} Norman, \textit{Commerce Secretary Wants Technical Data Restricted}, 227 \textit{Science} 1182 (1985).

\textsuperscript{113} See supra note 50 and the quotations therein.

\textsuperscript{114} According to \textit{Science}, supra note 112, the National Technical Information Service functions as a central clearinghouse to which government agencies send their unclassified documents for public distribution.

\textsuperscript{115} Wilson, supra note 95. See also Norman, \textit{DeLauer Questions DOD Censorship}, 224 \textit{Science} 471 (1984).


\textsuperscript{117} Wilson, supra note 95. See also \textit{N.Y. Times}, May 3, 1984, at B14, col. 3.

\textsuperscript{118} See \textit{N.Y. Times}, supra note 117. Vice Admiral R. A. Miller, Vice Chief of Naval Materiel, reportedly has criticized four senior Navy civilian employees for participating in radar courses at the George Washington University school of continuing education, despite the absence of any indication that the courses covered anything but unclassified radar fundamentals. 224 \textit{Science} 1409 (1984).


\textsuperscript{120} The writer has attempted to ensure, but of course cannot guarantee, that this paper is current on the status of technical data export controls as of April 1, 1985, when his final revision of the piece was completed and delivered to the \textit{Yale Law & Policy Review}. A few notes referring to events and sources after April 1, 1985 have been added in proof.

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